SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE TUDHOE IRON AND STEEL WORKS.

he Weardale Iron and Coal Company's Works comprise (besides Tudhoe Iron and Steel Works) ironstone mines in Weardale, blast-naces at Towlaw, and extensive collieries at Towlaw and at lhoe; at both of these places large quantities of coke is made of superior quality usually produced in South Durham. There are r blast-furnaces at Towlaw, erected in 1846, 48 feet in height; e of these are in operation. The gas from one of them only is ised for heating part of the boilers in connection with the two wing-engines. The pig-iron produced at Towlaw furnaces is le principally from the Weardale ironstone; the bulk of this is to the Tudhoe Iron Works to be manufactured into finished iron. m the nature of the ore and coke used a high class of iron results, essing great ductility and tensile strength, fitting it for all pur-s where tenacity and durability are required.

ORGES AND MILLS.—The working of the Tudhoe forges and roll-mills commenced in the year 1852, and now furnish employment bout 980 men and boys. There are four trains of forge rolls, all ne line, driven by two engines—that is, one engine drives two e trains, one train on each side of it. Nos. 1 and 2 forges have three pairs of 18-in. rolls; they are run at the rate of 34 revo-ns per minute. The engine in connection with these is a beam densing engine, 44½-in. cylinder, 7-ft. stroke, 40 lbs. steam pres-cut off at one-fourth of the stroke, and worked expansively; kes 17 strokes per minute, while the rolls make 34 revolutions. vacuum obtained is about 10 lbs. The fly-wheel shaft is on the d motion, and the rolls are on the third motion; there is the heavy gearing appertaining to this arrangement. The engine os. 3 and 4 forges is a beam condensing one, 45-in. cylinder, and r in other respects to that for Nos. 1 and 2 forges. No. 3 forge ree pairs of 18-in. rolls on one side, and make 34 revolutions. forge has three pairs of 16-in. rolls on the other side of the en-which make 40 revolutions per minute. The engines are both sed in houses built of ashlar stone, the beams resting on the walls. The cylinders are covered to prevent radiation of heat. ch forge there is attached a helve hammer for shingling, mo-is given to these from the large engines; for No. 2 forge a 6-ton le-acting steam-hammer is used for the same purpose, made by Brothers, of Sheffield, and for No. 4 forge there is a 4-ton steam-ner. Three pairs of cutting down shears are worked by each e, which serve for the corresponding forges. At the back of forge train are two rows of puddling-furnaces, eight in each total puddling-furnaces, 63. Between the rows 24 horizontal le-flued boilers are erected; the heat from two furnaces is uti-by one boiler, one to each tube. The length of shell is 12 ft.; eter, 7½ ft.; each tube 2 ft. 4 in. in diameter. The boilers are lly covered with felt, their height from the ground is not more 7 ft.; this occasions a heat about the furnaces intolerable in weather, and is found to be a serious impediment to the labour men. In these boilers steam is generated for the two engines team-hammers. The forge is completely covered by two bays ought-iron roofing. To facilitate the changing of rolls and ma-y two travelling crabs are used; these run the entire length of ilding over the line of rolls on an elevated framework, com-of two sides, on which rails are laid; the distance between the s 33 ft.

ween the forges and rolling-mills there is an open space. The g-mills department is covered by three bays of wrought-iron g, resting on a screen wall on the western side, and supported t-iron columns at other parts. There is the same arrangement velling crabs the whole length of the building, as in the forge. ill furnaces are at the back of the rolls, and the large aren in of them is appropriated to cutting and straightening machinery, r loading the iron into trucks, all under cover. There is an ap-ce of order and stability in the erections and machinery not o be found in iron works, in this country at least. There are ills in one line, all in operation, and driven by two large en-

The first engine has a 45-in. cylinder, making 18 strokes per e; it is similar in other respects to the forge-engines, but is not ed, the beam resting on cast-iron standards. It drives on one it a 26-inch plate-mill, with three pairs of rolls, at the rate of olutions. The finishing rolls are provided with a steam-lift to he slabs of iron to the top of the upper roll. A pair of shears nection with this mill, driven by a small engine, will cut plates length and 1¼ in. in thickness: a smaller pair of plate-shears n motion from the mill-engine. The rail-mill, on the other the 45-in. engine, consists of three pairs of rolls, driven at the 30 revolutions; the rolls are made to act on the reversing prin-y a crab and clutches. In connection with the rail-mill there circular saw, two punches and straightening presses, the latter by an independent engine. The second mill-engine has two h horizontal cylinders, 3 ft. stroke, 40 lbs. steam-pressure, non-sing, making 20 strokes per minute. The rolls are driven on rd motion. This engine drives on one side a mill with two f 16-in. rolls and a saw; on the other side a mill having two f 12-inch rolls, one circular saw, and two pairs of shears; also ting-mill, and a guide-mill with three pairs of rolls and a pair rs. The guide-mill, by a change of spur-wheels, may be driven evolutions, and at two higher speeds. There are 20 mill fur-for the service of the various mills. The waste heat from 12 furnaces is utilised in generating steam in six horizontal double-boilers; each boiler is 20 ft. by 7½ ft. in the shell. Six other shire boilers, fired with coal, 30 ft. by 7½ ft. externally, are also ed to supply the mill-engines. The average produce of finished the Tudhoe mills is about 500 tons per week; this comprises and sheets, rails, bars of all sizes, angle-iron, hoop-iron, and ds, a large proportion of the manufacture being small sizes gh qualities, which command similar prices to the best Staf-re brands.

L WORKS.—In a line with the forges the building and ap-s for the manufacture of Bessemer steel were erected in the 58, and this was one of the first works established for the Bes-rocess. The blowing-engine consists of two 32-in. horizontal ylinders, two 42-inch blowing-cylinders, 5-feet stroke. The ressure is 45 lbs., not worked expansively, and condensed; uum-gauge indicates 5 lbs. only. There are four plain boilers, 5 ft., to supply this engine. The pressure of air required to be blown into the converters is 20 lbs. per inch. Four converters are erected on one framework, each of 2½ tons capacity. One or two converters are in operation at once; four heats are obtained from each in 12 hours. Before the converters can be used they are lined with gannister, a mineral which, when reduced to powder, forms a refractory material, suitable for this purpose or for fire-bricks of the best quality. Six tuyeres of fire-brick, with eight small holes in each, are placed in gannister at the bottom of a converter; through these tuyere holes the air is blown into the molten iron at 20 lbs. pressure, for the period of about 20 minutes in each heat; this throws out the carbon, phosphorus, and other impurities contained in the pig-iron. To the remainder a portion of speigeleisen is added to restore the carbon as one of the constituent principles of steel. The resultant cast-steel is then poured into ladles, and thence into moulds to form ingots; this is effected by hydraulic machinery. One converter turns out 17 tons of steel ingots in 24 hours.

There are four air-furnaces—two on each side—for melting the pig-iron, from which it is run direct to the converters. The Weardale and other high-class pig-iron only is used in the Bessemer process of steel making. The ingots are afterwards heated and rolled into rails, bars, and sheets: these sheets are now used for making the bodies of coal tubs, the bars are used for drawing-cages, and other work where lightness is a consideration. As compared with wrought-iron, one-third of the weight is dispensed with, and greater durability at the same time secured.

TUDHOE BLAST-FURNACES.—Two blast-furnaces are erected adjacent to the forges, and with the appliances requisite for smelting operations, are now nearly in a state of completion. The furnaces are 85 ft. in height, 26 ft. at the bosh, and 7½ ft. in the hearth. The body of each furnace rests on 12 cast-iron columns, capped by an annular plate. The furnaces are cased with wrought-iron plates, of uniform diameter to the top externally; they will be closed at the top by the cup and cone. The down-pipe to withdraw gas from each is 3½ ft. in diameter, joining to the main gas-tube, 5½ ft. in diameter; these are of wrought-iron, not lined internally. Immediately behind each furnace, six stoves with cast-iron pipes are built, in two rows. Between these rows the wrought-iron pipes to supply gas to the six stoves are fixed. Each stove contains 14 double cast-iron pipes, 16 ft. in length, placed in two rows; each pipe is 19 in. by 5 in. in section; the blast having to pass through one row of these pipes, or 14 lengths of single pipe, before it makes its exit. Each stove is provided with its own chimney. The main blast-pipe is 6 ft. in diameter. Behind the stoves one large coke-hopper is built for each furnace, and a gantry, under which limestone and other material is stocked. Behind this a line of five calcining kilns are in course of erection; these are 45 ft. in height, plated externally, 20 ft. inside diameter, and will have self-acting delivery at the bottom of the kilns. The top of these and the gantries are approached by locomotive roads. The furnace-lift is on the water-balance principle—one carriage ascends while the other descends. The water-tank is fixed 20 feet above the platform level. Three blowing-engines, acting independently, and non-condensing, are erected in one building. Each engine (the cylinders being vertical, the blowing-cylinder at top and the steam-cylinder under it) rests on two cast-iron standards. These engines are from the works of Cochrane, Grove, and Co., Middlesborough. Each blowing-cylinder is 84 in., steam-cylinder 40 in. in diameter, placed 6 ft. below the blowing-cylinder; stroke, 5 feet; the trunk at the top of the steam-cylinder is 18 in. in diameter; from this, by a cross-head and two connecting-rods, motion is given to the fly-wheel shaft, and two fly-wheels of 7 tons each, all within the standards. One eccentric gives motion to two piston-valves. The extreme height of the engines from the foundation is 25 feet. The blowing-cylinders are enclosed with sheet-iron, and by means of a pipe to the outside of the building the suction-valves will draw air from the exterior. The engines are designed to go from 20 to 30 strokes per minute: at the ordinary rate of 20 strokes each engine will supply 7600 cubic feet per minute, and at the maximum, 11,400 cubic feet. In the same building two engines are erected, to supply water for the furnace-lift and the tuyeres; each engine works two double-acting pumps with a plunger. There are also two smaller engines erected to feed the boilers. Eight plain cylindrical boilers are being fixed, 75 by 5 feet, each suspended from five arched girders, resting on cast-iron pillars, 5 feet in length. The boilers will be heated entirely with gas from the furnaces. The chimney is 130 feet in height.

TUDHOE COLLIERY.—The Weardale Iron and Coal Company have a very extensive taking of mineral property in the Tudhoe and Hett district. Tudhoe Colliery is one mile distant from the iron works; two pits are sunk, 85 fms. in depth, to the Brockwell seam, 40 yards apart, each 12½ ft. in diameter, one as a downcast and one as a furnace pit; at both of these coal is raised by double horizontal engines, placed between the pits. The output of coal from both pits is about 1500 tons per day. The cages are single-decked, and two tubs are drawn in each. A small engine on the surface pumps water from the top feeders only, that from the mine being lifted in tanks by one of the winding-engines. The small coal produced by screening is all coked; 236 coke ovens are in operation; these are all of the dome shape, 11 ft. in diameter; they are charged at the top, and the coke is drawn out by hand labour; most of these ovens are constructed with side and bottom flues. Eighteen chimneys, about 40 feet in height, are built in connection with main flues for these ovens; one hundred more are in course of erection. Brick works for an extensive manufacture of fire-bricks are being laid out at this colliery. At Bishop's Close Colliery 400 tons of coal is raised per day, and one hundred coke ovens are in operation. In the yard adjacent to the forges and mills two pits are being sunk to the Brockwell seam; the pits are 20 yards apart; the downcast is 12½ feet and the upcast is 10 feet in diameter. Several fathoms of cast-iron tubbing have been inserted in each pit, chiefly in alluvial ground. The sinking engines in one case have a pair of 12-in. horizontal cylinders, and in the other a pair of 10-in. horizontal cylinders. The depth to the Brockwell seam will be nearly the same as at Tudhoe Colliery.

MINERAL TRAFFIC ON RAILWAYS.—The following railway companies each carried in 1868 more than 500,000 tons of coal and minerals over their respective lines and systems:—Blyth and Tyne, 1,969,998 tons; Furness, 1,911,731 tons; Great Eastern, 2,062,199 tons; Great Northern, 2,175,380 tons; Great Western, 6,452,724 tons; Lancashire and Yorkshire, 3,339,591 tons; Llanelly, 624,138 tons; Llynvi and Ogmore, 566,911 tons; London and North-Western, 11,027,810 tons; London, Brighton, and South Coast, 759,278 tons; Londonderry (Seaham and Sunderland), 879,380 tons; Manchester, Sheffield, and Lincolnshire, 2,631,571 tons; Maryport and Carlisle, 704,385 tons; Midland, 6,214,909 tons; Monmouthshire, 1,755,551 tons; North Eastern, 16,303,318 tons; North London, 590,552 tons; North Staffordshire, 1,375,882 tons; Rhymney, 945,561 tons; Taff Vale, 3,835,990 tons; Whitehaven, Cleator, and Egremont, 849,884 tons; Caledonian, 6,424,594 tons; Glasgow and South Western, 2,388,699 tons; and North British, 4,687,713 tons. Some of the least generally known lines have thus a very large mineral traffic.

GOLD MINING IN NOVA SCOTIA—OFFICIAL REPORT.

SIR,—Enclosed please find a statement of the quartz crushed and gold obtained from the different mines for May, June, and July.

The almost unexampled drought, since July 1, has caused a number of the crushers to stop work, and but few have sufficient water to work full time.

Mr. Selwyn, Director of the Geological Survey of Canada, who in a similar position in Victoria, Australia, has had a lengthened experience of gold mining, visited during the past month the principal gold districts in this province. He authorises me to state that he considers the gold-bearing quartz veins of Nova Scotia will generally compare very favourably with similar veins in Australia, some of which have been successfully worked to a depth of over 500 feet, affording for a series of years highly satisfactory returns, and that there seems every reason to suppose that gold quartz mining in Nova Scotia, divested of speculation, and conducted with increased skill, economy, and enterprise, offers as great inducements for the investment of capital as are generally met with in the richest gold fields in Victoria. Mr. Selwyn also entertains a favourable opinion of the probable value of the older gravels and diluvial deposits, more particularly when they occupy depressions in the immediate vicinity of gold-bearing veins, and where, at the same time, facilities exist for operating on them on a large scale by sluicing.

In alluvial mining in this province there has been, comparatively speaking, nothing done, and what has been done has in every case been on the elevations, and not in the depressions. This has been caused by the belief that there was not sufficient gold in the alluvium to pay the expense of draining the depression, and, in fact, there has never been a sluice built worthy of the name in the province.

JOHN KELLY,
Deputy-Commissioner of Mines.

Chief Gold Commissioner's Office, Halifax, Sept. 8.

Statement showing the quantity of quartz crushed and gold obtained from the several Districts in Nova Scotia during the months of May, June, and July, 1870:—

		May.		June.		July.	
		Tons.	Ozs.	Tons.	Ozs.	Tons.	Ozs.
MONTAGUE	Lawson	—	—	—	—	120	715
	Symonds	2	36	67	197	2	3
	De Wolp	18	4	25	9	—	—
CARIBAN		No returns		—	—	—	—
OLDHAM	Sterling	—	—	—	—	20	4
	Several	182	113	121	35	136	187
RENFREW	Several	617	146	195	48	183	99
STORMONT	Archibald	2	5	7	8	18	15
	Allen	6	3	4	1	—	—
	Gisborne	7	29	20	28	169	57
SHERBROOKE	Palmerston	210	67	221	67	130	70
	Wellington	248	173	223	154	164	105
	Dominion	293	123	323	123	308	161
	West	17	60	15	23	—	—
	Sherbrooke	—	—	41	37	79	102
	Chicago	—	—	—	—	11	6
	Other mines	200	112	145	136	130	77
TANGIER	Strawberry Hill	25	40	34	42	70	50
	Humber Co.	81	42	142	69	No crushing.	
	Burlington	44	34	79	57	No crushing.	
	Other mines	—	—	—	—	45	21
UNIACKE	Uniacke	180	49	—	—	225	58
	Queen's	15	16	7	2	—	—
	Other mines	6	2	21	9	—	—
WINE HARBOUR	Eld Dorado	100	60	109	55	137	52
	Other mines	49	26	7	6	—	—
WAVERLEY	Nth. American	10	2	16	5	—	—
	American Hill	102	60	50	32	—	—
	Rockland	22	2	—	—	—	—
	Lake Major	—	—	19	9	—	—
	Waverley	26	13	46	24	—	—
	Other mines	—	—	2	1	—	—
NEW MINES		52	27	6	2	14	2
Total		2514	1244	1945	1179	1961	1775

JOHN KELLY, Deputy Commissioner of Mines.

SMELTING WORKS IN THE UNITED STATES.

SIR,—It is most remarkable that, among the numerous schemes that have been started with English capital in various rich mining districts of the Far West, it does not seem to have occurred to capitalists to lay out their capital in a manner that could not fail to be immediately remunerative and paying. The deceitful and fabulous accounts given by interested vendors and promoters of their various mining claims and mines seem to have dazed the brain of our good practical men of business, and they have rushed into schemes without due consideration, and often without further evidence than the excited accounts of the would-be vendor, who in nine cases out of ten is a thorough stranger to them, and who has sought them out as being men of influence, likely to forward their extravagant and thoughtless schemes. That the precious and base metals exist in fabulous quantities in the Western States of America there can be no doubt; the evidence is overwhelming, and from the liberal laws of the United States the mines have almost always, when discovered, fallen into the hands of backwoodsmen, trappers, teamsters, &c., the class of men nearest to the spot when the discoveries were made in Colorado, Nevada, Wyoming, Montana, &c. These men, after a little experience, although capable of making discoveries of mineral-bearing rock, have, of course, no practical knowledge of minerals, and do not know the value of their ore; thus, thousands of mines have been opened which will not bear the expense of working, but have been considered good enough to sell—aye, and have been sold, to the bitter disappointment of the purchasers, who have, on the faith of the *bona fide* richness of surrounding properties, given immense sums for a valueless mine, no further developed than by a mere scratch in the earth, 15 or 20 feet deep. Thus these adventurers, while making their own fortunes, have done immense injury to the immediate development of the undoubted mineral riches of these territories. It has, therefore, been self-evident to me for a long time, and my opinion has been confirmed over and over again by miners from these districts,

that as there is no doubt of the existence of these metalliferous riches the erection of smelting and reduction works, with a subscribed capital for purchasing the ores direct from the miners for ready money, is the desideratum of all these mining districts.

For reasons above stated the miner is never a capitalist, and consequently cannot open properly and develope his mine without the help of money, and as capital is charged for at the exorbitant rate of 2½ to 5 per cent. per month in all these territories, it is self-evident it would be ruinous to borrow at these rates; thus numberless "claims" are unworked at the present moment. If, however, he had some ready means of turning his ore into cash on the spot, thousands of good mines would be worked to the profit of the mine owner and proprietors of smelting and reduction works, as they need not purchase a pound of ore that would not be reduced at a profit, and the moment it is reduced and turned into bullion they would have their profit and capital available for further operations.

In those districts where works have been built, although erected and worked in a crude and unscientific manner, never getting out of the ore more than 80, and sometimes only 60, per cent. of its contents, enormous fortunes are being made by their fortunate owners, who have had the enterprise and pluck to erect them. Owners whom I have conversed with frankly admit that their profit, with all the present extravagant cost of labour and fuel, is not less than from 300 to 400 per cent. on their capital.

The ores found in the Rocky Mountains, both on the Atlantic and Pacific slopes, are of various kinds, some of them, as the sulphuret ores of Colorado, are most intractable, while others, as the rich chlorides and carbonates of White Pine district, in Nevada, can be most easily and economically reduced on the spot; therefore, after duly considering the subject, I am of opinion that White Pine, in the midst of these classes of ores, is the spot where English capital might be most usefully and profitably expended, with a certainty of reaping large and immediate results, without any of the numerous contingencies and risks to be found in an ordinary mining speculation.

The metalliferous riches of White Pine Mountain are inexhaustible, and they can be all easily reduced by the smelting process. I have before me the results of a small blast-furnace in this district, producing 5 to 6 tons per day, worth at least $130 to the ton; and it appears after purchasing and working the ores there is a positive net profit of more than one-third of the total amount produced. With these results there can be no doubt that the erection of smelting-works is the most safe and profitable speculation in the mining districts of America. I leave immediately for a tour of inspection in these districts, and will from time to time communicate to your readers the result of my observations on the spot.

New Broad-street, Sept. 22. —— A PRACTICAL MAN.

COPPER MINING ON LAKE SUPERIOR.

SIR,—I have not written for several months, for two reasons—because there has been nothing good to write about; and because you have acquired other correspondents in this region, one of whom I notice writes from this county over the same signature that I have used for several years.

The supposition now is that the copper interest of Lake Superior has touched bottom; at any rate, we cannot go much lower without going altogether out of sight. To give you a correct idea of the present state of things, I will name the mines that were at work a year ago, and state what they are now doing.

In the Portage district the Quincey is the leading mine, and is now, as for more than a year, producing from 120 to 140 tons of 80 per cent. mineral per month. This mine is working at a fair profit. The Pewabic and Franklin Mines, on the same lode as the Quincey, are let on tribute: their resurns have been 60 and 80 tons per month respectively; they will in a short time dwindle down to nothing, and lead to the ultimate, and not far distant, abandonment of the mines, unless the stockholders see fit to pay another assessment for the purpose of opening them. The Franklin has long been doing business on a large scale, raising commonly 12,000 tons of rock per month and stamping 8000 tons; yet, although handled with strictest economy, can not meet expenses; a rise of 3 cents per lb. in copper would make this a profitable mine.

The South Pewabic, up to the end of June, was producing 100 tons of copper per month. This mine is now undergoing a skinning process, prior to suspension. The workmen have not been paid up, but by stamping the rock broken in the mine, and using the supplies on hand, without replenishing them, it is thought sufficient profit can be made to meet liabilities. This mine possesses the most powerful stamping mill in the world.

The Hancock Mine is at work, after a suspension of 12 months, the company having decided to remove all the paying ground now open, and abandon the concern. The coming winter will probably "finish up" the Hancock Mine. The returns will be from 25 to 35 tons per month, as formerly.

I had almost forgotten to mention the Huron Mine has also stopped: the returns were from 60 to 80 tons per month up to June 1.

The Isle Royal, Shelden, Columbia, and Grand Portage, each fully equipped, and provided with reducing machinery, capable of making returns equal to the Hancock, have all been stopped; so that of eight important mines, producing 12 months ago from 550 to 600 tons of coper per month, only one, the Quincey, is doing legitimate mining.

The mines on the Conglomerate are still yielding excessive quantities of copper. From reliable sources I learn that it is the intention of the management to run the product of the Calumet and the Hecla Mines up to 500 tons of copper each per month. There is probably some limit to the amount of available copper to be obtained from those mines, and some, who wish it is true, speak of a widging out of the lode in the deeper levels; but it would seem that they intend to make good any deficiency that might be occasioned by the falling off of other mines. They are making immense profits, but it is an open question whether they are pursuing the wisest course. The Schoolcraft, on the same lode, is as yet a small mine, improving in depth, however, and they are preparing to increase returns by the erection of more stamps. They take out now about 30 tons monthly. The Allonez, on a parallel Conglomerate lode, is suspended: they have good prospects, but, having no machinery, have made no returns. They employed 20 men.

Ontonagon county is almost depopulated of miners. The Ridge Mine employs the greatest number—say, from 35 to 45. This mine is doing something better than meeting expenses. The National Mine employs 12 miners; these are doing a sort of digging business. "Meet expenses, or stop," is the order. They are making good returns for the number of men employed. The Caledonian, from 25 last winter, has dwindled down to 4 miners now employed. The old Minnesota Mine is let on tribute to 8 or 10 miners, who are earning good wages in "picking out her eyes." this company has been, and I believe still is, working on a south lode, which is represented as being a very promising property. A few tributers are scattered about in the other mines of the county, who for the most part are earning fair wages. Ontonagon county has felt the depression more, perhaps, than any other section of the copper region—at any rate, until very recently. Although it contains many young and promising mines, when poor times began to come on they were not very extensively opened, and in several instances not equipped with machinery. The common order from the company is to "meet expenses, or stop." Mines well opened stop part or all of their sinking and drifting for a time, and so eke out their existence. This pays for a time, but it is unnecessary to state how it ends. In Ontonagon only a few mines had any reserves, or were in a position to make returns, consequently they went under first. They will not be lost sight of, however, nor does it require a large outlay to start them. A permanent advance in the price of copper, or a corresponding reduction is the cost of supplies and labour, and the county would probably see a time of general activity, while the mines of other districts being more extensive would, like other heavy bodies, move slow.

In Keweenaw county several mines have been suspended, the most important of which is the Cliff. The Cliff has been producing from 60 to 70 tons of copper per month; the deepest level is the 170; for the last month they took out 100 tons. It is quite possible that the Cliff will again be worked, but the water once let in it is to be feared that the sto page is for an indefinite period. Preparations are being made now to stamp the burrows; these have been accumulating for twenty years, and are said to contain large quantities of copper.

The Garden City Mine is stopped. This was a small concern, its returns never exerted a very telling influence on the copper market, but being shut up adds one more to the number of idle mines. The Mendota is also stopped. An English company has been working this for copper ore, which occurs here in a belt of conglomerate in connection with a regular transverse fissure vein. The ore is rich, but only small quantities have yet been taken out. The Amygdaloid Mine is employing two miners only. This mine has had a lingering existence, but its fate is almost sealed now. The Central Copper Falls and Phœnix Mines are working their regular forces, and meeting expenses, perhaps doing something better, from returns. The Phœnix is represented as being a very rich mine; it yields about 80 tons of copper per month. A French company is working the Clarke Mine; they are spending about 7000*l.* per month, chiefly in exploratory and opening work.

Times are, of course, dull, but the miner is doing better than might be expected after perusing the very gloomy catalogue of abandoned mines that I have penned. Pay varies from $45 to $50 per month, and there is no surplus of men in the country. The mines were stopped shortly after the opening of navigation, giving ample time to clear out before the winter sets in. Marquette Iron Mines have absorbed the greater part of those leaving the copper region, although quite a number have gone down into the lower States. Should any new mines be started there would soon be a demand for men, which could only be met by a rise of wages. I am not anticipating anything of the kind, for awhile at least, but merely mention it to show that there are but few men in the country who are in want of work.

MINER.

A GLANCE AT COLORADO, U.S.A.—No. II.

GEOLOGY OF THE EASTERN SLOPE OF THE ROCKY MOUNTAINS.

SIR,—Since writing my last article (which appeared in the Supplement to the Journal of Aug. 6) I have made two journeys, of about 30 miles each, into these mountains. Taking them as two transverse sections, I find they differ materially, not in their lithological character so much as in the respective depths or points of contact of the several systems; consequently, to give a comprehensive description of them it cannot be limited to a single locality, as it would convey an erroneous view of their general structure as an entirety. To delineate them properly would involve a good deal of time to sketch and write, and a large space in the Journal to insert—neither of which are convenient to either the contributor or publisher. I must, therefore, endeavour to embrace them in one section, drawn obliquely with the parallelism of the ranges. I admit such a figure is unscientific; but, under circumstances, there is no remedy.

FIRST DIVISION.—Commencing in Boulder county, 8 or 10 miles out on the plains, we find ourselves on the Tertiary, the Pliocene portion of which has been swept away by the final retiring waters, which carried with them all the light organic substances they contained, and denuding the Miocene, which is left pretty nearly entire, and the Eocene beds perfectly so. The lignite coal seams, which at present alone are worked, are in the Miocene, and give an aggregate of about 40 ft. in thickness. No winnings have yet been made on the Eocene. This crops out towards the foot of the mountains, indefinitely with the underlying Cretaceous. Its irregular line of emergence is chiefly attributable to the action of the faults, and other local displacing agencies, that have disturbed these measures, causing them to present a rolling or undulating figure.

The Cretaceous comes to surface, forming part of the foot-hills, but the exposed edges of its strata are very thin—in no place yet have I discovered it exceeding 800 ft. in thickness. The inclination varies from 30° to 80° eastward, influenced more or less by the lateral thrust of the preceding system, or that on which it reposes. I have not yet come to a positive conclusion where to place these outcropping strata, but am inclined to cede them to the upper beds. They consist of fossiliferous sandstone (slightly ferruginous), white earthy limes, and strong blue limestones—fine whit grit sandstones and chert. These lie on the bottom, with lime shales, gault, and greensand. The two latter I have not found *in situ*. The specimens collected were found among the *debris* of the mountain slopes. It is probable they came from some portion of the lower strata, whose protruding edges were contemporary with the present flanks of the Trias, and, like its edges, greatly eroded. Further to the south of this place beds of true chalk are to be seen; but they are void of the layers of nodular flint, so common to the Cretaceous deposits in the counties of Surrey, Kent, and Sussex, in England. As yet I have found but thirteen fossils or fossil imprints of the *genus* fauna. These consist of belemnites, annelides, rhyncholite, producta, terrabutala, ostrea, and mytilus—which two latter are abundant. Fragments of various crustacea, some doubtful pectens, and a large variety of minute infusoria and coralline forms. Apart from a solitary gryphea, I have seen nothing of the ammonite species, which we should suppose would be well represented. The spinifer, which is so abundant in the West Alleganies, I have not yet found here, as well as many others which should be present. Of the flora fossils there is a great sparceness, too. We find some large stumps and roots of petrified trees, apparently a kind of cedar; also a willow or magnolia. I do not know if the cedar is ever classed with the conifers; but pine trees must at some time have existed here, for the coal seams are interspersed with grains and lumps of pure crystallised resin, as transparent as Norway amber; yet I have found no vestige of resinous or other gum trees. These trunkless stumps lie both in the floor and roof of the seams, and often in the coal itself. They are not carbonised, or but slightly so. I believe they are not indigenous. Their rounded edges show they are drift wood, but how they should have floated here in a silicified condition is not very plain to understand; litchens and other cryptogramic plants, leaves of the magnolia, aspen, and maple, with some others, all of which are deciduous. The great bulk, however, of the vegetable fossils consists of marsh plants, reeds, rushes, and grasses. Some few are found entire in the sandstone, where their impressions are very distinct, but generally they are much comminuted. Now, it will be seen that several of the aforesaid fossils belong to the Jurassic, and others the Permian era, and a few to to the post-Carboniferous. Yet we find none below this Cretaceous and Tertiary group of rocks. The demarcation in certain places is very distinct and well defined. A white fine-grained aluminous sandstone lies conformable with the red rock system below—its juxta-position renders the division sensibly plain.

The SECOND DIVISION consists, first, of a group of red, blueish, and brown strata, and which, in the absence of a better definition, I shall call the Trias system, although the distinctive features which give this formation its name in Europe cannot in its true sense be applied here, for the Oolite and Lias are not positively represented. There are certainly three distinct kind of rocks—Red Sandstones, argillaceous claystone, course and fine conglomerates, and blue, green, white, red, and brown-black quartzite. The sandstones are often of a deep red colour, and so fine grained that they might be classed as indurated arenacious clays; the brown variety are the coarsest. Mica in very comminuted particles pervade the whole series. The conglomerates vary in their structure. They are composed of coarse sand and pebbles, the latter from the size of a pea to that of a hen's egg, the finest portion being on the bed or plane of deposition. The cementing medium appears to be silex. They are all extremely hard. The pebbles are mostly of quartz, which are not much water-worn; they evidently have not travelled far, for some of their edges are almost sharp. Some of the other pebbles are composed of gneiss, lime, felspar, porphyry, syenite, &c. These are generally more rounded off, and came in all probability from the central ranges. These have evidently been long periods of repose in the waters where these rocks were deposited, as the claystones are perfectly homogeneous, and then followed by a like delicate fine-grained sandstone. All have been subjected to a great heat, as they are metamorphic. The quartzite rocks are not so uniformly stratified—they are composed of granular, tabular, and crystalline quartz, coloured by metallic oxides, from the delicate milk-white of the chalcedony varieties, through the jasper reds, down to the brown and black flints and hornstones. In transparency some are as pellucid as rock crystal, many vitreous, but the bulk are opaque, yet all are translucent. No fossil or any impression of an organic substance has thus far been found on this line of section about the first division. Can it be possible these rocks are or ever were azoic? Their proximity to the cretaceous forbids such an idea—yet, if they ever existed, where are they gone to? Closer and more extended research may discover some. I should think this formation is from 7000 ft. to 10,000 ft. thick—the dip of its strata varies from 35° to vertical. Some have reversed their normal position, and now form anticlinals. The upheaving forces have not been uniform. Veins of coarse injected granite pass through the quartzite beds, and for a short distance into the Red Sandstones, but do not appear to have reached the conglomerate beds. Some geologists entertain the opinion that the absence of organic remains is due to the metamorphic condition of the rocks. I cannot admit this hypothesis tenable, for the superior molusca during this presumed epoch was very abundant, and some of their casts or impressions would have been left in the indurated clays. Their non-existence enshrouds the whole in mystery. No useful metallic minerals except iron, and this in very small quantities, have yet been found in this formation—it attains an altitude of 8500 feet above sea-level, or 3500 feet nearly above the plains. I have quite recently sent specimens of most of these rocks to London, with one of my geological sections, for exhibition, which may be found on application to the office of the Journal.

We next look for the Permian group; but along the line I am describing there is no appearance of it. What sandstones I have examined bear no resemblance to the New Red of either Europe or those of the Eastern States of this country; of clay-shales there are none. It is just possible that in the great convulsive movement which displaced so many of the rocks it may have been overlapped, and thus be hidden from view, for about 40 miles further to the south there is a group of saliferous strata, with gypsum and alum slates, from which alkaline, chalybeate, brine, and other mineral springs continually issue; but I am at present not acquainted with their relative position. In a future article on the Burdsall Soda Lakes, which I am going to examine, I shall fully describe them. They may yet be found to belong to the Permian.

Following this we now look for the Carboniferous formation, and here again we are at a loss—not the least evidence of it is to be found. Examinations by other explorers have been made along the range for over 100 miles, and transversly for 40 miles in several places, but without success. My opinion is that this system is most certainly *non est*.

CHAS. S. RICHARDSON.

Christopher-street, New York.

GOLD MINING IN GRASS VALLEY, AND VICINITY.

SIR,—The mine on Alta Hill is doing exceedingly well; the company, after expending $100,000 in the erection of machinery, sinking shaft, driving levels, &c., have at last cut the lead of gravel, which is likely to pay good interest for the money invested; last week they cleaned up $1000. The Seven-Thirty Mine is turning out good rock, and the specimens produced are very rich; employing six men, and returning about $2000 per month. The North Star Mine is paying well, producing very fine rock, with specimens amazingly rich. The Ophir (or Empire) Mine, since the management changed hands, is doing much better; the present manager, in driving north, cut another part of the lode, which is yielding very fine rock, and the specimens taken out are exceedingly rich; they have resumed paying dividends, which have been in abeyance for a long time. At Osborne Hill Mine, four men prospecting cut into a beautiful lode, and enormously rich, paying over $200 per ton, which enabled them to pay a dividend of $4000 each for one month's work; the specimens found in course of their working greatly assisted them. At Coe Mine, in sinking the engine-shaft the party got down on a splendid lode, paying from $25 to $30 per ton. The Eureka Mine is just keeping on the even tenor of its way, paying from $25,000 to $30,000 per month in dividends, and likely to do so for years to come. The Idaho Mine is looking better than it has for a long time; they have an immensely rich lode going east, and very large. This augurs well for the Grass Valley Consolidated, being situated to the east, and joining the Idaho ground. The Eureka Consols Mine is doing splendidly; the last milling, 74 tons, broke from the lode in the shaft, over 6 ft. wide, paid $28·50 per ton. This is supposed to be the best mine in the locality, and when thoroughly opened will pay the largest dividends. The Pittsburg (late Wigam) Mine is paying well; they have found the lode under the slide, and are opening out a new mine. Returning at present about $5000 per month; they expect this amount will soon be considerably increased. To the west of the above mine is situated the Nevada Consols; three lodes have been discovered on this property, each of them producing very fine samples of gold. Perrin's Mine, at Forest Springs, is doing well, and paying good dividends.

The Union Hill, I am truly sorry to say, is to be numbered with the things of the past; operations have been suspended, water is at the top of the shaft, and it has become a drinking place for swallows. This mine paid from the start, and went up to within a few weeks before it was stopped; they took out about $10,500 in eleven days, thus showing the rich bunches of rock the lode contains, and it was from such rich bunches that the mine paid its way, and gave dividends. It cannot be possible that this fine mining property was stopped by means of poverty, it must certainly have been some other cause; the mine is equally as good now as it was when purchased by Mr. George Batters and Company. The machinery is defective, and not at all calculated for the work it had to do; by this means I am persuaded that the stoppage is only temporary, and when things are rectified, and put into proper shape, the company will resume operations. It is impossible that such a mine as the Union Hill will long remain idle.

I expect that in about nine or twelve months quite a number of mines in the vicinity of Grass Valley will be worked by water-power; $500,000 have already been spent in bringing the water to within six or seven miles of Grass Valley, when another $100,000 will complete the work. The company's chief engineer has been looking over the ground; he says the scheme is practicable, and will be carried out at once. This being done will have a tendency to reduce the surface cost in mining just four-fifths to what it is now.

Union Hill, Aug. 31. —— THOMAS FAULL.

THE METALS AND THEIR ORES—GOLD—No. XII.

SIR,—Some of the more prominent of the physical and chemical properties of gold will be discussed in this paper.

Hardness.—In the list of metals arranged by Dumas gold ranks softer than platinum, palladium, and copper, and harder than silver, bismuth, and tin. As gold when pure is somewhat soft, if it were employed in coinage or in the manufacture of articles of jewellery, &c., in this form it would quickly wear out. It is, therefore, alloyed with other metals, generally silver or copper, in order to increase its hardness and durability, as we have before shown that alloys of metals are usually harder than the individual elements composing them. English standard gold is an alloy containing 11 parts of gold to 1 part of copper, by weight, or 8·33 per cent. of copper. This alloy is less ductile than pure gold, but is harder and more fusible. The quantity of pure gold contained in an alloy is always estimated in relation to standard gold, and is expressed by the word carat, the representative number of which is 24—namely, 22 parts of fine gold and 2 parts of copper. Thus, if a piece of gold is said to be 18 carats fine, the bulk will be understood to be composed of 18 parts of pure gold and 6 parts of alloy, or 4 carats worse than standard. The addition of a certain quantity of gold to steel is said to bestow greater hardness to the latter metal, which retains its cutting edge longer than when without it.

Tenacity.—From experiments conducted by Guyton Morveau it was ascertained that a gold wire 0·787 of a line in diameter will support a weight of 150·753 lbs., whilst an iron wire of a similar size is capable of sustaining 549·250 lbs.

Dilatation by Heat.—According to Lavoisier and Laplace the linear dilatation of standard gold, between the temperature of 32° and 212° Fahr., is represented by the decimal 0·0,014,661=1·682nd, or the length of a bar of gold at 32° being 1·00,000, by increasing its temperature to 212°, its length would be augmented by expansion to 1·00,146.

Specific Heat.—According to the celebrated French experimenter, Regnault, if 1000 expresses the amount of heat necessary to raise a pound of water from 32° Fahr. to 212°, the caloric required to raise the same weight of gold to a similar temperature will be 0·0324.

Conductivity for Heat and Electricity.—From careful experiments undertaken by MM. Wiedmann and Franz it was ascertained that if the conducting power of silver, the best conductor of heat and electricity, be taken at 100, the conductivity of gold for heat is 53, and for electricity 59.

Magnetic Action.—Faraday was the first to demonstrate that all the metals were amenable to the influence of powerful magnets, many of them being so in a sense the reverse of that of iron. When suspended in the magnetic field iron, with other metals of the magnetic group, points axially north and south, whilst gold similarly suspended points equatorially east and west, and is amongst the diamagnetic list of metals. In the electro-chemical classification of the metals gold stands at the head of those which are electro-negative, zinc being the most electro-positive of the commoner metals.

Chemical Properties of Gold.—The combining weight of gold is 197, hydrogen being 1; its chemical symbol is Au (aurum). Gold combines with oxygen in two proportions, as sub-oxide of gold Au 2, O, and oxide Au 2, O 3. These oxides do not unite with acids. Gold also forms combinations with the elements chlorine, sulphur, &c. There are two combinations of gold with chlorine—the chloride and tri-chloride, the latter being the most important of the gold compounds. A convenient method of forming a solution of gold is to dissolve the metal in a mixture of two measures of hydrochloric with one of nitric acid. The free acid having been carefully expelled by heat, reddish-coloured crystals of tri-chloride of gold, soluble in water, remain. Substances having an affinity for oxygen decompose and liberate metallic gold from solutions of the chloride; thus, on adding a solution of proto-sulphate of iron to a solution of chloride of gold a copious brown precipitate of metallic gold is thrown down, constituting one of the characteristic tests of the presence of gold. If a piece of silk or ribband is moistened with chloride of gold, or if figures be traced with the solution, and the fabric be held whilst moist to a current of hydrogen gas, a film of metallic gold will be deposited wherever the silk is touched with the solution. Ether also di-solves tri-chloride of gold, and if an ethereal solution is made by adding to a solution of the chloride twice its bulk of ether, and the mixture after being well agitated allowed to stand, the ether containing all the gold will rise to the surface, and may be poured off. If small perfectly clean steel articles are dipped into this ethereal solution they will, after the ether has evaporated, be found to be coated or gilt with gold.

EDWARD GLEDHILL.

Mining Offices, Shrewsbury, Sept. 19.

PRUSSIAN PATENTS—ENGLISH TRADE.

SIR,—The remarks in the Journal of Sept. 10 are quite correct—it is very seldom that a patent can be obtained in Prussia. The Government views on this subject are to give as much freedom as possible to the staple trades and manufactures of the country. We find that whenever any new invention is met with in any part of the world, or often only improvements, they are sure to be patented in England, whereas the Prussian manufacturer can make and sell the same article free of any royalties or charges to the patentee, and can, therefore, undersell the English in many of our foreign markets. A gentleman said to me the other day, "Looking at the heavy taxes which are laid on English industry, I often wonder that England can compete with Prussia at all; but still," said he, "Prussia at present is only a child, and should not a great reform take place in England during the next few years, England will find herself dreadfully behind."

Cologne, Sept. 16. AN ENGLISHMAN IN GERMANY.

JOINT MEETINGS OF ENGINEERS AND SHIPBUILDERS AT GLASGOW—No. III.

SIR,—The important paper of Mr. Morison, on "Mechanical Ventilators," merits particular attention. This paper, and the discussion thereon, goes far to prove the superiority of this mode of ventilation, both as to efficiency and economy, to the old mode of Furnace Ventilation. Mr. Simpson gives his views, derived from experience, and takes a small Fan, 16 feet in diameter, applied to a pit of shallow depth, being only 40 fms. This fan is driven by a small engine, only 8-inch cylinder, and the expenditure of steam is quite trifling, yet 36,000 cubic feet of air per minute is got. It requires no attention, never gets out of order, and has been at work five years. The total cost of this fan and erection was 420*l.*—a very moderate sum.

The remarks of Mr. Lupton are very interesting: he appears to think that the Guibal ventilator will prove the best at a slow speed, and the Rammell best at a high speed; while Mr. Cochrane contends that the Guibal will prove best at either high or low velocities. I do not think that the Rammell ventilator has been sufficiently tested at high rates of speed. There is one very good machine of this kind working in this district; although it is not of large size, yet it gives good results at a moderate speed, and it may possibly prove better at higher rates of speed. This Rammell is also placed in a very peculiar position, being underground, in the same position as a furnace would occupy, and, of course, it offers every facility for the drawing of coals at both shafts, which is accordingly done. This position is evidently superior for all purposes, and possesses great advantages as compared with a fan placed at the surface; but it may be urged against this that the cost of placing a fan underground will exceed considerably the cost of placing one on the surface. With respect to the Guibal fan, so far as it has been applied, it has certainly given every satisfaction.

The remarks of Mr. Marley are very valuable: he, very properly, advocates the use of large shafts for ventilation; and, also, that ventilating shafts should be exclusively used for that purpose. He also contends that mechanical ventilators will prove best in all cases, both for shafts of small and great depths: in fact, for all sizes; and when all the circumstances are fully weighed, there is no doubt whatever that he is, in the main, right. A deep shaft, intended for furnace ventilation, is necessarily very costly, for it has to be lined completely with walls of an expensive character; and when tubbing is used the heat generated is often, even when every precaution is taken, productive of mischief. It is difficult to keep this tubbing, when of great length, tight at the joints, as the expansion of the metal is considerable; and when the shaft is cooled, which often is unavoidable for the purpose of repairs to the furnace and shaft, contraction takes place, and the joints often leak. All this is entirely avoided when mechanical ventilation is employed, and there is little doubt that in the future this mode will become all but universal. It is, therefore, of the greatest importance that the best kind of fan should be thoroughly known, and fully tested.

There appears to be no chance whatever for the Wardell machine, as it has been fully tested at Pelton Colliery, and compared with the Guibal, both working under precisely the same circumstances, and the latter was fully proved, contrary to expectation, to be much superior. But the Rammell, a very ingenious machine, having a very distinct character, appears to require still further trials at high rates of speed. And there are also other machines mentioned in the paper of Mr. Morison, and also in the discussion, which appear to be well worthy of further trials.

The fan tried at High Park Colliery appears to be particularly worthy of notice; it is, indeed, supposed by some to be superior to the Guibal; and no doubt there are other fans, not enumerated, well worthy of further trial.—*Newcastle, Sept.* 19. M. E.

RAPID BORING.

SIR,—For the information of those interested in mining property, I venture to ask you to give publicity to the following accomplished fact:—The Machine Tunnelling Company are sinking a deep shaft through hard rock near Portmadoc for the Croesor United Slate Company, by means of Messrs. Beaumont and Appleby's Diamond Boring Apparatus. At a depth of 211 yards the slate vein had not been reached, and it was a matter of importance that its anticipated position should, if possible, be proved before the general meeting of the shareholders. The Machine Tunnelling Company undertook to drive one of their drills from the bottom of the shaft in advance of the sinking. They explained, however, that as their tackle for exploring purposes was as yet experimental, they could only guarantee to do their best to put the hole down as deep as possible. They accordingly commenced sinking the trial hole with one of the ordinary drills of their Tunnel-Boring Machine at 5 o'clock P.M., and at 5 A.M. the second day, or in 36 hours gross time, they had sunk 84 feet, and gone 6 feet into the hard "chert," or flint band, which overlies the slate vein, bringing up core specimens of the rock.

This unprecedented result was obtained in time for the meeting, and was of great importance in proving the correctness of the estimated depth, and enabling the directors to realise their exact position. The Machine Tunnelling Company are preparing to undertake prospecting work of this character, and their engineers are of opinion that with proper tackle they will be able to prove ground at the rate of 50 feet a day, for a very considerable depth. From what they have done I see no reason to doubt that this view will turn out to be correct, the present result, 84 feet in 36 hours, having been accomplished with no special apparatus, and ordinary ¾ gas tubing was used for lengthening the drill beir. If such a speed can be maintained, I think it will be of the greatest importance to mining interests.

The above having been actually obtained, I ask you to give it publicity, as I consider it is the forerunner of a change in the system of boring, the importance of which may be difficult to estimate.

H. U. MCKIE, Esq., C.E.,
Manager to the Croesor United Slate Company.

A SCIENTIFIC TOUR IN WALES AND CORNWALL.

SIR,—As I am well aware you are always glad to hear the opinions of disinterested tourists on the various mines, &c., they may chance to visit, we venture to send you a short account of our mining tour in Wales and Cornwall. First, then, taking the train for Chester, where we arrived late in the evening, we commenced by visiting on the following days some of the Flintshire mines, which are, we are led to believe, in one of the most promising districts in North Wales, and which district has returned vast quantities of lead to market for a long time past, and still keeps up a constant flow.

The lead mines in this district at and about Flint and Mould are most productive at the junction of the *Mountain Limestone* and *Millstone Grit* formations of the Halkin Mountains, the ore being found chiefly in calc-spar veins in the former. Several of these mines are worked at considerable depth, having yielded large quantities of ore nearer the surface.

The first mine we passed on our road was the DEEP LEVEL, worked on an extensive scale by the Messrs. Taylor, to a depth of 230 yards. Next came the RHOSESMOR, which has lately been re-started by some gentlemen out of the district. Here three powerful engines are hard at work completing the draining to the great depth of 140 yards; this work will, it is believed, drain many adjacent mines. This mine has been aforetime worked with great success.

We next arrived at the BRYN GWIOG, or (now called) WEST PANT-Y-GO MINE, where the operation of draining has just been completed, and where cross-cuts are being driven at a depth of some 220 yards: much blende (sulphuret of zinc), associated with fluor-spar, as well as galena (sulphuret of lead), with calc-spar, has recently been obtained here. Our next object of visit was the NORTH HENDRE MINE, where magnificent masses of galena (lead ore) were being brought to surface, from a depth of about 90 yards, weighing some 2 and 3 cwts. each, embedded in calc-spar. There is a lode here of 3 feet nearly solid ore. We here saw some remarkably clear and interesting specimens of calc-spar, showing well one characteristic—that of double refraction. They are here returning about 15 tons, or more, of ore per month. We pass on now to the TYDDYN-Y-GWYAT, worked on a small scale, at 80 yards deep, as a private mine, and yielding good ore.

Adjoining this, due east, and half a mile north of the North Hendre, is the VRON UNITED MINE. This property we selected for special examination, because, firstly, it has recently been taken up by some gentlemen in London, and is in progress of complete and thoroughly efficient development, under the able management of Mr. Matthew Francis; secondly, because in the district it is looked upon as a characteristic mine, being in the most promising measures, having three known (and other suspected) lodes running through the sett, and also having yielded splendid ore at a comparatively shallow depth, together with the fact of its being in the heart of the richest mines in the district. Having obtained the necessary authority for an underground visit to this mine, we were met by the manager, who kindly conducted us through the entire workings, and pointed out to us the various lodes, showing how some had been *slightly* thrown out by cross-courses, while others had increased in richness by the junction of cross strings. The principal work had been performed at the 60 yard level, but now the mine is being rapidly and extensively opened out at the 80 yard level, where immense masses of ore, similar to that of North Hendre, are being extracted. The mine is in course of being deepened to the 100 yard level, and cross-cutting to meet the main lode is being carried out. The deeper mines in the neighbourhood aid considerably in draining the mine, and the company are now having extensive machinery for pumping, crushing, &c., erected. This mine has, we believe, just been made into a limited liability company, in which the whole of the former holders have taken up their interest in shares, so highly is the property thought of in the district, as well as elsewhere. It is confidently believed the new company will return about 40 or 50 tons of ore per month shortly, and this ore, like that of North Hendre and some other adjoining mines, has been proved to be very rich in silver. The reason we hear so little about most of the mines in the locality is, we believe, because they are privately worked—many only on a small scale.

We next made a run across country to Snowdon, and visited a lead mine recently being worked there, known as PEN'ALLT. There quite a different nature of rock presents itself, far harder and older, of Lower Silurian date, probably Cambrian slate, and one that would give you the idea of yielding copper ore, if only sufficient depth were attained for the purpose. The company are driving levels into the mountain side, and extracting considerable quantities of lead ore, much interspersed in the hard quartzose lode. The working of this mine has quite changed the appearance of the district. Where all was before desolation is now life and activity. Very considerable surface works have been carried on—water-wheels erected, large buildings filled with separating, dressing, and jigging machinery, and a powerful Blake's crusher, with a portable steam-engine, set up; this will doubtless make short work of the hard, tough ore put into its powerful jaws.

From Pen'Allt, *via* the pretty and interesting village of Beddgelert, we proceeded to Port Madoc, and from that place by the Festiniog Railway to the PALMERSTON SLATE QUARRIES. These extensive and valuable works are doubtless so well known to your many readers as to need no comment; suffice it to say they afford employment for hundreds of hands, and pay grand profits to the fortunate owners. We cannot pass over our first journey on the Festiniog Railway without a word. This interesting Lilliputian railway is constructed on a 2-ft. guage, and so made as to be able to climb rapid inclines and turn sharp curves, by reason of the shortness of the carriages and general lightness of the rolling stock, combined with powerful engines, the more powerful being double, and constructed on the Bogie principle. The train runs from Port Madoc to Dinas and Duffws, and to Festiniog, and carries both passengers and slates (down from the mine), &c. It is well worth a visit by all tourists in that locality, running as it does round the mountain side, and through prettily wooded country, as well as commanding interesting views.

On again reaching Port Madoc we proceeded to Llanbrynmair, and there visited a mine called FRON VELLAN, being worked by a private London Company on some proved lodes, one of which is believed to be a continuation of one of the lodes of the GREAT CONROY MINE, at a short distance from this property; the mine holds out a good prospect of success, some ore having been already extracted; and the company are now actively pressing forward a deep adit from the northern side of the hill, for the purpose of cross-cutting these three proved and known lodes at a considerable depth. The nature of the rock is here different from the mines aforementioned, being of the Terannon clay-slate of the Upper Silurian period, predominating in that part of Montgomeryshire. Near here we visited another small mine, called the NANT MINE, remarkable by reason of an extraordinary land slip which occurred here a short time ago, revealing an extensive lode at surface. Large masses of ore, of 1½ and 2 cwts., were removed by hand from the exposed lode at surface, where the ore appears in considerable quantities; some levels had in time past been driven low down the hill, but abandoned just before the lodes were reached. The present proprietors profitting in experience by the failure of their predecessors, and being guided by the exposed lodes, are pressing on actively their operations.

Descending now through Wales, and crossing the Bristol Channel, we reached Cornwall, where we took up our abode for a short time at Travend, and proceeded, first, to Tintagel, to visit the far-famed historical King Arthur's Castle. Here recently a London company has set about excavations in the clay-slate rock in search of lead ore, in which they seem to have been very successful, and now a mine is in course of working, known as KING ARTHUR'S MINE, from the castle whose foundation is thus being undermined by the active agency of man, whose enterprising spirit knows no bounds. This mine may be likened to some on the south-west coast of Cornwall and in the Isle of Man, having its entrances on the main land, but its mining passages and levels under the sea. There appears here to be several lodes, and shafts are in course of being sunk to the required depth, and levels driven to intersect these lodes at suitable depths below the surface of the sea, when very satisfactory results will, probably, be obtained. Much copper pyrites is found in association with the lead ore (which is exceedingly rich in silver), and it is said in years gone by small workings were carried on for it.

Our next and last visit was to a mine that has been so much noticed in your columns recently—the OLD TREBURGETT MINE, in this district, about seven or eight miles off, in the parish of St. Teath. We saw on the ground the captain of the mine, Capt. Hancock, who kindly conducted us through the entire workings, *above and below surface*, and pointed out the celebrated silver ore found in the capels of the lode. Even pieces of *pure silver ore* were brought to hand. This reminds us of years long gone by, when the North-East of Cornwall was so noted for its silver. The prevailing rock here is much the same as at Tintagel—an argillaceous slate deposit, or grauwacke, associated with greenstone. The main lode in this property extends for a long distance in a N.N.E. to S.S.W. direction, underlying slightly from E. to W. There are three shafts—engine-shaft, Grinder's, and John's, the latter two having lines of rods to them from the engine (which is a very powerful one, and capable, it is said, of draining the mine to a 200 yards level), and working with horse-whims; the engine is now at work draining the water throughout the mine at the 30 yard level, to which depth the engine-shaft is cleared and secured. In almost all parts of the mine we visited the capels were standing intact, and their richness in silver increasing considerably as we descended. There were also large masses of lead ore standing in the engine-shaft at 22 yards, and smaller quantities in the other shafts. Great piles, moreover, of some tons both of lead ore and silver ore and capel were at surface, cleared from the old workings: the ore on assay gave a *very high percentage of silver*, and the masses standing in the shafts were valued at 50*l.* per fathom, the lode here being 9 ft. wide. The deep adit level beyond John's shaft, about 50 yards from surface, is now yielding lead worth about ¾ to 1 ton per fathom in the killas rock, and it has every appearance of lasting; it is gradually improving. The water was still in Grinder's shaft below the 30 yard level, so we were unable to see the fine lode, with rich silver ore, that so many of the old workers in the mine had produced ores from—but the captain gave us reasons for believing he should soon reach it. Everywhere hereabouts the capels were standing, and though at so shallow a depth were yielding some hundreds of ounces of silver per ton. An immense deal of work has lately been effected in this mine, and that, too, very efficiently performed—with the encouraging prospects before it. We re-echo the full belief of the district that OLD TREBURGETT MINE will not only turn out one of the most lasting but also one of the most paying in Cornwall. We were much gratified with our inspection of this mine, and believe that our visit to Old Treburgett formed a pleasant finish to a very interesting mining tour, which we closed on taking carriage to Bodmin, thence by train here.

SCIENTIFIC TOURISTS.

SCIENCE IN MINING.

SIR,—I fear to apologise for again troubling you with my correspondence, since "F. G. S.," whose letter I noticed on the 3d inst., seems to think that an apology to you must be necessarily an apology to him, and that it is our bounden duty to retire immediately in consequence of having made it. He, however, appears to have read that portion of my letter as carelessly as the remainder, judging from his irrelevant and unargumentative reply. He takes exception to what he calls my illustration of Science in Mining, and says that he prefers a mere derivative definition of a word that has been in use for centuries, and almost lost its normal signification, to an explanatory paraphrase, not on account of the incorrectness of the latter, but simply either because it is a paraphrase, or because he will not understand it. Refusing to follow my reasoning, in which I attempted to show that, according to the premises on which I based my argument, Mechanical Science is not Science in Mining, he carefully excerpts that phrase, and says that they are necessarily identical, for the sole reason that the former has proved so beneficial to the latter. Had he chosen to have remembered what I wrote, he would have found that I used rather stronger confirmatory language to the same effect. When he states that some of the questions I asked were simply the inquisitiveness of folly, and therefore fairly unanswerable, I think it only candid that they should be stipulated by him to allow others to form an opinion. He also seems to have misunderstood my object in writing, inasmuch as he considers I made my "attack" on the Old Treburgett Mine, and not on his letter; had he quoted any other mine, though it may not have answered his purpose to have done so, I should hardly have altered a single word.

I am sorry to see his disability to answer any of the necessary questions I put to him with regard to the Old Treburgett Mine. He promises us as full a reply as possible on his return from an inspection of the property; I must perforce accept his disavowal of any intention to puff the mine, but how he could possibly have only used it as an illustration when his ignorance of it is so great that he is unable to afford us any information as to its general and peculiar aspects, which only now he purposes to investigate, I am unable to see. On his return we may hope to have the results contrasted with those of the mines mentioned by "C." in his letter, so as to be able to form a judgment for ourselves.

That a person who wilfully misapplies the exordium of a letter, isolates certain passages so as to deprive them of their context, and carps at a definition as mere verbiage, without denying its truth, or substituting a better, should brand another as captious, reminds one of the street boy's brilliant repartee, "You're another." I can fairly say, as Bassanio said to Shylock, "I thank thee for the word." CHARLES THOMAS.

3, *Great St. Helen's, London, E.C., Sept.* 22.

SCIENCE IN MINING.

SIR,—I see in the Journal of last week "F. G. S." has taken notice of a few remarks I sent to you on the 3rd instant, in which I stated my objection to the system of puffing in epistolary correspondence, and quoted the communication of "F. G. S." as a case in point. He now says he only mentioned certain mines as illustrations of his previous general remarks, and deprecates the system to which I object, as much as myself. I, of course, am bound to accept this explanation, but should certainly like to know wherefore those eulogistic epithets with regard to the manager and directors of the Old Treburgett Mine, which seem to me wholly foreign to the consideration of *Science in Mining*. Granting his good faith, however, I wish to say a few words on the remaining portion of his letter. The position which "F. G. S." takes is sufficiently lofty to make one hesitate in attacking his "dogmata," for he arrogates to himself, by his own election, the championship of science; as, however, he seems to have assumed this position, I suppose I must leave him there, but certainly shall not blindly assent to his infallibility. From the pedestal on which he sits he tells us "*Fools may ask questions that wise men cannot answer;*" and then, by adroit reasoning, which has a certain taint of egotism about it, tries to impress one with the unpleasant fact that if any question be put to him by an enquirer after knowledge, which he, from his exalted position, is unable to answer, it necessarily follows the questioner must be a fool. "F. G. S." reminds us of a class of people in the world by whom it is a far greater compliment to be called a fool than a wise man. He then condescends to agree with one of my remarks, but proceeds to say "*this is no reason for captious individuals to endeavour to prevent scientific men from lightening their darkness.*" If this means anything, it means that I am a captious individual, and that by my letter I tried to prevent "F. G. S." from enlightening his own darkness. God forbid!

In conclusion, I beg to assure "F. G. S." I offered no apology for my former letter to you, as I did not consider one necessary, but have no doubt he does earnestly desire that all who ask straightforward questions, and complain that they cannot get straightforward answers, would retire. I think he may still apply to himself the greater portion of what I wrote on Sept. 3.

Another correspondent, "T. L.," enters the lists on behalf of "F. G. S." His remarks concerning me are unworthy of notice; they are rude without being caustic, and impertinent without being witty. Such will never receive attention from me.—*London, Sept.* 21. C.

THE QUEEN MINE.

SIR,—In answer to the questions of "A Shareholder," in last week's Journal, I beg to inform that gentleman that what I have been in the habit of calling moderate quality silver ore has been 100 ozs. per ton, and sometimes have not altered my term on the point if even the produce has exceeded 200 ozs. per ton. Of course, we are very careful of less quality than 100 ozs., or even 50 ozs., and might come back to 10 ozs., or even lower quality—a quantity of which low-class silver ore we are storing up for treatment on the mine, for our amalgamation process, as soon as the engine is started, and no allusion to this is made in my reports. What I term good quality silver ore is 500 ozs. and upwards, and rich silver ore 1000 ozs. per ton and upwards. The weight of bags referred to vary according to quality, but will average (say) 75 lbs. per bag.

As to raising and preparing for market 500 tons of copper and mundic per month, anyone at all acquainted with mining will at once see that if 10 men can and have raised over 50 tons per month, 100 men, by the same rule, would raise 500 tons per month; but this, of course, cannot be done until the engine makes a start, the mine drained of water, and sufficient ground laid open to put on the required number of men to accomplish the work.

I have not a single doubt of the success of the mine, but so much work as we have to do will take time. I consider good progress has been made in the building of the engine-house, which will be completed in the course of nine days, and credit is due both to the engineer and masons who undertook the work; and I have no doubt but that the engineer (Mr. Wm. Mathews) will use his best efforts to complete the erection of the engine with all possible dispatch.

I am bold enough to say that my reports in the *Mining Journal* or to private

gentlemen have been to the best of my judgment, and, so far, have been borne out by facts.—*Harrowbarrow, Callington, Sept.* 20. W. KNOTT.

TERRAS TIN MINE.

SIR,—I have read with much interest the various reports which have appeared in your Journal on this mine; but, inasmuch as a letter a fortnight since expressed some doubts of its value, I venture to think an answer to the following questions would tend more to establish the mine than any number of reports, and I will feel obliged by your giving this letter publicity. I am much pleased to notice that the agents are in want of more miners, and I hope this discovery may be the means of stopping the exodus of our mining population, which, in consequence of long-continued depression, has been excessive for many years.

1.—How long have the 32 heads of stamps been working, and when where the additional 16 heads set to work?

2.—What quantity of tin has been sold, and what remains on the floors?

3.—What number of tons of elvan stone are stamped out per day? From the great width of the elvan I presume the stone is moderately easy to stamp and break, and, judging from what I have seen elsewhere, I should estimate the quantity likely to be stamped every 24 hours at 1 ton per head, or, allowing for contingencies, (say) from 40 to 45 tons daily. OBSERVER.

RELATIVE MARKET VALUE OF PROGRESSIVE MINES.

SIR,—Comparisons may be odious, but are sometimes instructive, and when the market prices of many of our progressive mines are compared, it is impossible to understand by what rules the public are guided in their investments. Perhaps some of your readers can explain why such enormous differences should exist between the prices of the following mines:—

Assheton	£72,000	Bwadrain Consols	£ 9,000
Caegynon	21,000	South Merllyn	3,750
West Tankerville	36,000	Great Retallack	3,035
Cardigan Bay	60,000	Rydtallog	24,000
Terras (Tin)	37,500	South Condurrow	13,776
Tan-yr-Allt	30,000	New Lovell	8,192

There is a certain amount of unprofitable work, requiring both time and money, which must be done before a mine can prove remunerative, and to the unprejudiced and practical observer it must be apparent that of the foregoing mines those selling at the lowest prices are, in reality, in the best position. I should not expect a practical miner to draw a favourable comparison between Terras (Tin) and New Lovell at even prices, and may, therefore, be reasonably astonished to find that the former is commanding more than four times the price of the latter. Cardigan Bay is quoted business done at the rate of 60,000*l.* and Bwadrain Consols at 9000*l.*, and yet I observe that the latter sells regularly 30 tons of lead ore per month. Surely such anomalies as these are worthy the attention of the investing public. WILLIAM MARLBOROUGH.

1, *Great St. Helen's, Sept.* 22.

MINING PROSPECTS IN VICTORIA.

SIR,—I have the honour by direction to forward the enclosed report of the Association on the condition and prospects of the miners in Victoria, and to request that you will kindly publish the same for the information of our fellow-workmen in the "old country:"—

REPORT.

In consequence of the many untrue reports now in circulation throughout England respecting the condition and prospects of miners in Victoria, we feel it a duty we owe to ourselves and to intending emigrants to place before them a true and impartial account of the labour market and the future prospects of mining in Victoria. Ballarat being the most important gold field we have—the miners here may be taken as applying to all parts of Victoria—we wish to impress upon those miners who contemplate coming here the following facts:—

1.—That there are in the Ballarat district a very large number of miners out of employment.

2.—That the Ballarat alluvial mines are rapidly being worked out, and as each terminates its existence large numbers of miners are added to those already out of work.

3.—That there are very few progressive alluvial mines to take the place of those at present yielding gold, so that the prospect of again employing our miners in alluvial mining in and around Ballarat is proportionately reduced.

4.—That the surface and shallow workings are all but exhausted, those working them being compelled thereto from lack of other employment.

5.—That a very large amount of work has been done in connection with our quartz heaps during the past 15 years, but with few exceptions they have failed to yield sufficient to pay working expenses (exclusive of labour), the exceptions employing but few men, and most of them paying but a very small interest on the capital invested.

6.—That out of a very large number of leases taken up during the past two years for the purpose of working quartz, nine-tenths are already abandoned, although a very large amount of capital has been expended thereon.

7.—That capitalists have to a large extent withdrawn their money from mining enterprises.

8.—That neither the Government nor the capitalists will assist to discover or to open out new gold fields, but leave it to the operative miners. As the means of these become contracted their ability to prospect ceases, hence the discovery of new fields to absorb our surplus labour has become of very rare occurrence.

9.—That the miners find it very difficult to obtain work outside mining, because every other department of manual labour is overcrowded, like their own.

10.—That in no branch of manual labour is regular employment to be obtained, the average term of employment ranging from six to nine months in the year.

11.—That it is impossible for the miners or any other labouring men (without capital) to take advantage of the Land Act and settle down to farming, in consequence of the difficulty of obtaining a living while bringing the land under cultivation; to which must be added the expense of fencing, clearing, building, and obtaining the necessary farming implements, as also the absolute necessity of paying a certain amount of cash each year to Government, with the alternative of being turned off the land.

The nominal rate of wages for miners and labourers in Ballarat is 2*l.* 2s. per week, but in consequence of the uncertainty of employment allowing a man to average eight months in the year only—which is quite as much as may be reckoned on—the wages really average about 28s. per week throughout the year.

The following is a very moderate estimate of the expense of a family in Ballarat, per week, exclusive of living, clothing, &c.:—Rent, 5s.; fire wood, 2s. 6d.; water, 1s. 3d.; schooling, with books, for two, 2s. 6d.; benefit society, 1s. 3d.; rates, 4d.: total, 12s. 10d.—balance, with which to meet all other expenses, 15s. 2d.

L. A. POWELL.

Ballarat District Miners' Association, Sturt-street, Ballarat, July 16.

YUDANAMUTANA COPPER MINING OF SOUTH AUSTRALIA.

SIR,—I perused the report of the proceedings of our meeting, as published in last week's Journal, and I am bound to confess my utter inability to thoroughly comprehend the policy of our directors. I attended the previous meeting, and, if my memory serves me, Mr. Salmon, one of our directors, stated that he did not look for any successful results until the railway shall have been completed, and urged that mining operations should remain in abeyance until that period. Knowing that Mr. Salmon has given this matter the most careful attention, I attached importance to his opinion, but now, according to your report, additional capital is to be raised, and upon most onerous terms, although the completion of the railway is as far off as ever.

Another point is with regard to Mr. Fiveash. The Chairman has upon several occasions informed us that Mr. Fiveash is a gentleman of the strictest probity, but in his management the board had certainly lost confidence. If this be so, why is Mr. Fiveash continued in his present position? Is Mr. Fiveash, in whom the directors have lost confidence, to be entrusted with the expenditure of the additional capital proposed to be raised? When the company has been freed from its indebtedness, should not all further expenditure and control be placed in other hands? There are, to my mind, many other material matters that require to be amended before there is much hope for this company. It does not appear from your report that any reference was made to the Yudanamutana Mine, which is admitted to be of greater mineral value than Blinman. Could not Yudanamutana be sold to another company, and the proceeds applied to the requirements of Blinman? Surely, this would be a much sounder operation than so heavily weighting the ordinary capital, the practical result of which must be to render the shares valueless and unsaleable. Shareholders, I think, will regret with me that these important considerations were not urged at the meeting.—*Sept.* 21. A SHAREHOLDER.

[For remainder of Original Correspondence see to-day's Journal.]

IMPROVEMENTS IN SEPARATING SILVER FROM ORES.—In the extraction of copper from Spanish and Portuguese pyrites and similar ores by the ordinary humid process—that is, by roasting the ground burnt ore with common salt or other chlorides, and subsequently lixiviating the product—the lye contains copper together with a little silver, and small quantities of some other metals. Hitherto this silver has been precipitated along with the copper by means of metallic iron, and their separation has been attempted in various ways. Now, according to an invention just patented by Mr. F. Claudet, the silver is separated previous to the precipitation of the copper, and this is done by adding to what are technically called the copper liquors a substance which decomposes the chloride of silver dissolved in them, and which by combining with the silver forms iodide of silver. A soluble iodide of potassium effects this object by transforming the dissolved chloride of silver into iodide of silver. If at the same time the liquors be slightly diluted a precipitate of subchloride of copper ensues. This precipitate carries down with it the insoluble iodide of silver formed. The blowing of steam through the liquors will facilitate the proper admixture of the iodide solution with them. From numerous trials it has been found that the proportion of silver to copper in Portuguese pyrites is about 8 parts in 10,000 parts; an estimation of the copper present in solution, therefore, affords in this case an easy method of ascertaining the quantity of soluble iodide to be added, so as to avoid an excess. After the addition of the iodide the liquors are, as before stated, diluted with water until they become slightly turbid, and are then blown up with steam, and afterwards allowed to settle. The clear liquor is now drawn off to the precipitating tanks, whilst the sediment contains the silver as iodide of silver, together with subchloride and oxychloride of copper, some lead, salts and oxides of iron. The subchloride and oxychloride of copper are dissolved out in the sediment by means of very weak hydrochloric acid. After washing the sediment is heated with water and metallic zinc added. The iodide of silver is reduced to the metallic state, whilst soluble iodide of zinc is formed. This is separated from the deposit by filtration or otherwise, and the amount of iodine in solution determined. The iodide of zinc thus produced is now used over again for precipitating a fresh quantity of silver from the copper liquors, although in the first instance iodide of potassium is the salt preferred. In this way the iodine is continuously worked over, and comparatively only a small loss of that substance has to be provided for.—*Mechanics' Magazine.*

FOREIGN MINING AND METALLURGY.

We again find it impossible to attempt anything like a detailed report of French metallurgy. Until the Prussians can be got somehow or other out of France every branch of French industry and enterprise must suffer grievously. The Northern of France Railway Company has been authorised by an official decree to replace iron rails past service with steel ones, to the extent of 4519*l.*; for this sum it is to be feared that not much of the permanent way will be steel-railed. The same company has also been authorised to expend 26,278*l.* in the purchase of ten locomotives and twelve tenders. The execution of these arrangements is, doubtless, contingent upon a cessation of hostilities.

The state of affairs appears to have become more difficult for Belgian coal owners. An export movement has been rendered well nigh impossible, and the demand on home account is moderate, Belgian industry being generally in a somewhat languishing state. Stocks are accumulating, and there is no immediate prospect of an improvement in affairs. There are also apprehensions of a "credit crisis" in Belgium, and should these fears be realised the colliery proprietors may be shortly obliged to restrict their production. They appear disposed, however, to postpone as long as possible any contraction of their operations. The Belgian General Company for Promoting the National Industry, which possesses a number of collieries—or, at any rate, which has a large interest in several collieries—has issued a circular to its agents, and to the directors of the industrial companies acting under its patronage. In this circular the directors of the General Company state that they will neglect nothing to maintain or develope work as much as possible in the establishments placed under their patronage. The quantity of coal imported into Belgium in the first six months of this year is officially returned at 115,706 tons, of which 46,000 tons came from France, and 56,000 tons from England. The Zollverein and the Low Countries sent about 13,500 tons. The corresponding imports for the first half of 1869 were 112,755 tons; an increase of nearly 10,000 tons is remarked in the imports from France and England, and a diminution of 6000 tons in the imports from the Zollverein and the Low Countries. The imports of coke into Belgium in the first six months of this year amounted to 5396 tons, against 3349 tons in the corresponding period of 1869. In the first six months of this year Belgium exported coal to the extent of 1,843,414 tons, against 1,640,945 tons in the corresponding half of 1869, and 1,759,712 tons in the corresponding half of 1868. As hitherto, France has this year been again the principal outlet for Belgian coal; that country imported Belgian coal to June 30 this year to the extent of 1,772,138 tons, against 1,573,169 tons in the corresponding period of 1869. It is to be feared that the second half of this year will not present anything like such favourable results. In the first six months of this year coke was exported from Belgium to the extent of 361,983 tons, against 309,516 tons in the corresponding period of 1869.

Although the various Belgian metallurgical firms have still orders in course of execution, they are far from being assured continuous employment. At present the State and the leading rail producers have not arrived at any agreement in respect to the quantity and price of the rails to be supplied for the Belgian State Railways. It appears that the imports of steel of all kinds made into Belgium in the first six months of this year amounted to 2561 tons, against 2032 tons in the corresponding period of 1869. The imports of minerals into Belgium to June 30 this year amounted to 330,219 tons, against 257,193 tons in the corresponding period of 1869. The Zollverein supplied Belgium with minerals in the first half of this year to the extent of 205,945 tons, France to the extent of 113,297 tons, and the Low Countries to the extent of 10,667 tons. The imports of rough pig and old iron into Belgium amounted in the first half of this year to 51,061 tons, against 25,862 tons in the corresponding period of 1869, or nearly double; England supplied almost the whole of the rough pig and old iron imported this year. Wire, rails, plates, &c., were imported into Belgium in the first half of this year to the extent of 2732 tons, against 1736 tons in the corresponding period of 1869. The exports of steel from Belgium are very small, only 194 tons to June 30 this year, against 127 tons in the corresponding period of 1869. In the first half of this year minerals were exported from Belgium to the extent of 90,742 tons, against 74,348 tons in the corresponding period of 1869. France figured in this year's total for 64,000 tons, the Zollverein for 20,605 tons, and the Low Countries for 6112 tons. The exports of rough pig, old iron, and wire from Belgium in the first half of this year amounted to 4716 tons, against 9737 tons in the corresponding period of 1869. The exports of rails from Belgium in June amounted to 16,216 tons, against 19,794 tons in June, 1869. The exports for the first six months of this year present, however, an increase of 5144 tons, as compared with the corresponding period of 1869. As compared with 1868, there is an increase of about 33,000 tons, or 100 per cent. The exports of rails to Russia in June amounted to 8191 tons, then came Turkey with 3375 tons, Sweden and Norway with 1700 tons, and Spain with 1240 tons. During the first six months of this year Belgium exported 19,566 tons of rails to Russia, against 24,202 tons in the corresponding period of 1869; to the Zollverein, 18,318 tons, against 2225 tons; to Turkey, 12,356 tons, against 16,463 tons; to France, 4109 tons, against 4[illegible] tons; to Italy, 3832 tons, against 9959 tons; to the United States, 2999 tons, against 4180 tons; to Sweden, 1700 tons, against 730 tons; to Spain, 1657 tons, against 20 tons. Of plates and other descriptions of hammered, rolled, &c., iron the exports for the first half of this year amounted to 62,390 tons, against 61,599 tons in the corresponding period of 1869. Upon the whole, the exports of iron of every description made from Belgium in the first half of this year amounted to 133,852 tons, against 133,026 tons in the corresponding period of 1869. The second half of the year will, doubtless, present much less favourable results, unless the war should close, and unless also business should revive with unlooked-for rapidity. The annexed table shows how the totals of 133,852 tons and 133,026 tons were made up respectively:—

Destination.	First half, 1870.	First half, 1869.
Russia	Tons 24,259	Tons 27,419
Sweden and Norway	1,838	732
Denmark	53	554
Zollverein	31,531	19,669
Hanse Towns	2,056	2,196
Low Countries	10,807	14,129
England	6,032	6,141
France	23,704	20,336
Spain	2,008	192
Italy	5,825	11,958
Switzerland	2,591	1,700
Austria	1,163	1,329
Roman States	35	—
Turkey	14,229	17,043
Egypt	1,352	30
United States	4,883	7,565
Cuba and Porto Rico	791	565
Brazil	297	438
Rio de la Plata	58	411
Chili and Peru	273	327
Other countries	68	281

The Roman Railway Company has invited tenders for 7000 tons of Vignoles rails, to be delivered next month.

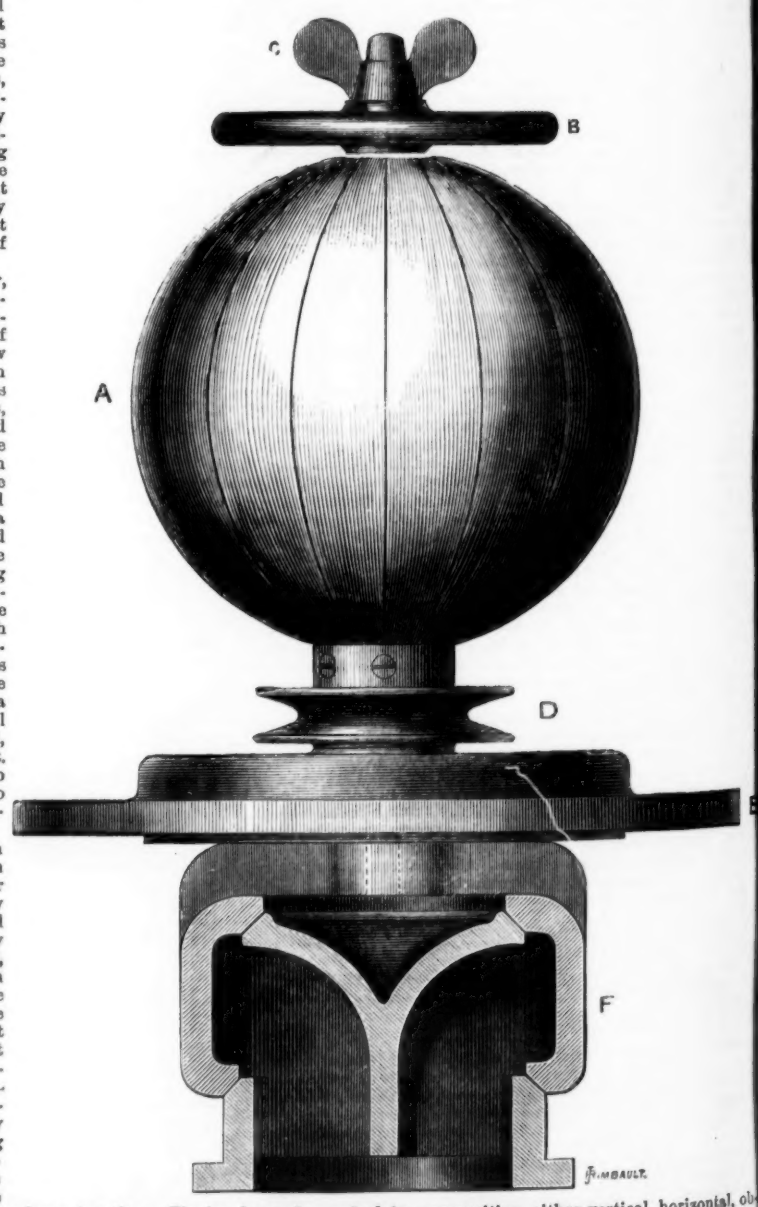
The foreign metal markets are generally suffering from the war. The last important transaction noted in copper at Havre comprises 150 tons, which changed hands at 64*l.* per ton, Paris conditions. The Dutch tin markets remain stationary. At Rotterdam comparatively little business has been done. Banca is quoted at Rotterdam at 75¼ fls. to 75½ fls.; Billiton, which has become scarce, is held at 74 fls. For deliveries in October or November purchases might be effected at 72 fls. Lead has not presented much change; upon the Dutch markets Stolberg and Eschweiler have made 11 fls. Zinc has been neglected upon the German markets. The price of the rolled zinc of the Vieille Montagne Company has been reduced to 24*l.* per ton upon the Belgian and Dutch markets.

GOLD MINING IN NOVA SCOTIA.—98 ozs. 13 dwts. of bar gold [illegible] the very satisfactory result of nine and a half days' crushing at the Glasborn Mine, Isaac's Harbour, during August; 27 tons of the main lead averaged 2 oz. to the ton, and 123 tons of the belt stuff about 7 dwts. Several hundred tons of quartz remain on hand, awaiting water-power, the unprecedented drought having very nearly dried up every spring and stream in the country. The contractors on the canal cutting, which is to supply the above mill with abundance water at all seasons, have put on 25 additional miners, and it is anticipated that the work will be completed before the close of the ensuing week.—*Halifax Morning Chronicle*, Sept. 3.

ECONOMISING FUEL.—A patent device for economising fuel has been put into the Lewiston Mills. It consists of a hopper and a mill for grinding coals, reducing the fuel, which is carried by the blower into the furnace with air enough to prodnce immediate combustion. The coal dust leaps into flame like a flake of powder. It is claimed that this device saves 33 per cent. of the expense of making steam. It is said that steam can be generated in one-half the time required by the ordinary use of fuel.—*American Gas-Light Journal.*

BOURNE'S PATENT SPHERICAL GOVERNOR.

The subject of our illustration is a novel form of Governor for steam-engines, that deserves notice for its ingenuity as well as for other more substantial advantages. The ordinary governor, with two revolving balls, was an invention of Watt, and in its original form it is probably more extensively used than any other. But its manifest disadvantage of having two heavy revolving balls has led to several modifications, the most important of which is undoubtedly that known as Porter's, in which the necessary centrifugal force is obtained by two light balls running at a great velocity, instead of two heavy ones running at a slow.



The existence of revolving balls, however, of any kind, with their attendant arrangement of levers and joints, is an inconvenience which it is one of the objects of Bourne's spherical governor to remedy. How far it does this our readers may judge from our illustration, in which A is a hollow brass sphere, formed of segments of thin brass, hammered to render it elastic, and fastened at the lower pole to a socket or sleeve, free to rotate upon a long bearing or pin, which projects from and forms part of the valve cover, E. This rotating socket is continued outside the sphere, and is furnished with a small pulley, D, from which the socket and sphere are rotated through a gut from the crank shaft. B is a hand-wheel with a long boss on its under side, which boss passes inside the upper pole of the sphere. The wheel has a screwed hole through it, through which passes the central spindle that communicates to the valve, F. This spindle is free to rise and fall, and to lift or shut the valve, but it is prevented rotating. C is a thumb-nut, which also screws on the central spindle, and serves to lock the hand-wheel, B, and fix it upon the spindle wherever set. The long boss of the wheel B is turned to form a bearing for the ring or socket to which the upper pole of the sphere, A, is attached.

The arrangement illustrated is one in which the central spindle is connected direct to an ordinary equilibrium valve, but the governor may, of course, be made to operate on any other kind of throttle valve, and be applied to existing engines. Its action may be briefly described thus—Suppose the engine stopped, the hand-wheel, B, would be screwed down until the valve was shut, and on starting the hand-wheel would be screwed back until the valve was fully open, at which position it would be locked by the thumb-nut, C. So it will be seen the valve also answers the purpose of a starting valve, and that the governor can be set by means of the hand-wheel to cut off or throttle the steam at any required engine speed. Now, the sphere being driven in the usual manner from the engine-shaft, on the speed becoming excessive the centrifugal force causes the sides of the sphere to bulge out, and the poles to come closer together. The lower pole is prevented rising, consequently the top pole is depressed, and through the central spindle the valve is closed to an extent corresponding to the depression. It will be understood that the only rotating parts are the sphere A and pulley D, and that the effect of the centrifugal force upon the sphere is to cause it to assume the form of an oblate spheroid, or sphere flattened at the poles, in a manner precisely analogous to that which is said to obtain in the case of our earth. As a governor for marine engines this instrument seems to be especially suitable, as it would obviously be unaffected by the rolling or pitching of the vessel. The inventor also claims for it that it may be fitted to any kind of engine with equally good results, and may be worked in any position, either vertical, horizontal, oblique, or inverted; also that it is cheaper than the common governor, more sensitive, and more elegant.

Our illustration is exactly half-size of a Governor large enough for an engine of 40-horse power.

We have only to add that the Governor is made by Messrs. John Bourne and Co., of Mark-lane, London, at whose offices one of them may be seen at work.

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